

## ON CERTAIN OBSCURE SPRAINS OF THE ELBOW OCCURRING IN YOUNG CHILDREN.

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THIS subject has attracted no little attention, Goyrand and Guersant in France, and Hodges in America, having especially written on it. The latest notice of it that I am acquainted with occurs in Mr. C. Heath's *Minor Surgery* (1883), and it will be seen from the following quotation from that work that the pathology has been, by no means, clearly made out, although the peculiar features of these cases—common enough—must be known to every surgeon. Mr. Heath writes: "Mr. Duncan M'Nab, of Epping, was good enough, in 1862, to call the author's attention to a peculiar injury occurring in young children, caused apparently by their being dragged forcibly by the hand. The symptoms are pain and inability to supinate the hand, which is strongly pronated, the arm is semi-flexed, and the deformity suddenly disappears upon the hand being steadily supinated by the surgeon, or frequently whilst he is examining the case. Mr. M'Nab regards the injury as a dislocation of the lower end of the radius from the ulna. M. Goyrand described the same injury to the Surgical Society of Paris in 1861, and maintained that it consisted in a displacement of the inter-articular fibro-cartilage of the wrist, in front of the carpal extremity of the ulna. Other French surgeons, however, have believed that the dislocation is at the upper extremity of the radius, and in this Dr. Hodges, of Boston, agrees. The author has met with several cases since his attention was called to the subject, and in some of these the injury, so far as could be judged, was at the wrist, whilst in others it was near the elbow. The treatment is to grasp and supinate

the hand steadily, when the parts will resume their natural position."

With all deference to so distinguished an authority, I venture to differ from the foregoing in several particulars. First, I believe that the lesion in the great majority, if not all cases, consists in a slipping of the radius out of the grasp of the orbicular ligament, which rests in the angle between it and the capitellum. Fig. 1 shows this, and represents the result of one out of many experiments on the dead subject. The accident is commonly produced by a dragging or other force applied to the hand in a condition of supination. *A priori*, then we should expect a downward displacement of the radius alone, for it need not be pointed out how little the ulna is concerned under such conditions. In those cases in which the force has been great it is probable that there is also a rupture of the thin part of the capsule connecting the orbicular ligament with the neck of the radius.

It will greatly simplify the matter if this one explanation be admitted. The various theories of the authors mentioned differ widely from each other. Dr. Hodges argues in favor of "a partial dislocation of the radius in one direction or the other." Mr. Heath thinks "the injury is in some cases at the wrist, and at others near the elbow." M. Guersant described typical cases, but suggested that many lesions may here produce the same symptoms. M. Goyrand at first believed that the lesion was at the elbow, but later abandoned this for the explanation mentioned by Mr. Heath—that the triangular fibro-cartilage at the wrist is displaced. Finally Mr. M'Nab suggested yet another theory. M. Tillaux, in his admirable *Anatomie Topographique*, strongly supports M. Goyrand's view: "A frequent accident, first noticed by M. Goyrand, and still little known, is a displacement of the head of the ulna over the triangular ligament. Let us suppose a movement of pronation, if this is too strong, one can imagine that the ligament arrives in front of the head of the ulna without rupture, it thus forms before the bone a sort of bridle, which hinders the movement of supination; that is to say, the return of the radius to its place. This accident appears exclusively to be produced in children, when one raises them sharply by the arm, to make them jump

a stream, for instance. They are brought with the hand in forced pronation, it being impossible to supinate it, the least movement being painful, the child keeps its arm motionless. The treatment consists in fixing the forearm with the left hand whilst with the right one sharply supinates—a slight but very audible crack is heard, and the displacement is reduced. It has been for long believed that one had to do with a displacement of the upper extremity of the radius in these cases." p. 549.

In the chapter on the elbow-joint, M. Tillaux does not mention any displacement, short of obvious dislocation, as occurring in young children, and hence to him these sprains have as their basis but one lesion, and that at the wrist-joint. But his explanation bears on its face a certain amount of refutation. The words, "*on conçoit*," show that, (so far as I know, like all other writers on the subject) he cannot appeal to post-mortem evidence or to experiments on the dead body; still more important is the account of the way in which the displacement is produced. Who would think of raising a child by its fully pronated hand? This movement is a means of torture almost confined to school-boys, at an age when the ligaments are much stronger. I have failed to produce any lesion in wrist or elbow on subjects older than 5 or 6 years by either pronation or supination combined with traction. But if the body of an infant or young child be taken and forcible traction applied to one hand during supination (it must be remembered that the force is great in the living subject—since frequently the child is lifted up or swung round by the person producing the accident), a peculiar snap will be heard. If the forearm is then dissected it will be found that the orbicular ligament has slipped up, and that this with or without rupture of the sub-orbicular membrane (if such a term may be allowed) is the sole lesion produced. If the elbow is now flexed and the hand pronated, the ligament again slips down into its right place, and again a snapping sound is heard. The experiment may be repeated several times, for by slight traction and supination the dislocation can easily be reproduced. In this second point I must beg to differ from Mr. Heath's description;—it is partly by supination that the displacement is produced,

and it is comparatively very difficult to reduce it without pronation. The reason is obvious on looking at the articular surface of the radius. Fig. 3 shows this part from in front during full supination, and it will be seen that the part opposed to the curve of the orbicular ligament (that to the right as in Fig. 4) is of considerable depth, and its upper edge a right angle; whilst the same part in full pronation (Fig. 4) is shallow, and has its upper edge rounded off. Hence in pronation a part is presented over which the ligament readily slips. These sketches are taken from adult bones, but the same holds true for young ones.

It may be urged that if the radius is displaced downwards at the elbow joint it must necessarily be displaced to the same extent at the wrist. But the term displacement is too high-sounding. It simply amounts to the depth of the cup (trifling in children), for the radius remains in contact with the capitulum, by the border of its cup. This, it will be admitted, can make no obvious difference to the relation of the ulna and radius below. If the force applied be extreme the liberated radial head will be driven forwards, and Mr. Holmes (*Surgical Diseases of Children*) figures such a displacement (compound in his case), and states that it is frequent in children. Professor Hamilton also says: "In children, and especially in those of a strumous habit, whose ligaments are feeble, a subluxation forwards, or even a complete luxation, is occasionally produced by being lifted suddenly from the floor by the hand, or by an attempt to sustain the child when he is about to fall. I have seen several examples of this latter form [complete luxation] of the accident produced in this way."

But the essential feature of these far more common sprains in early life is the upward displacement of the orbicular ligament, to which I have hitherto found no allusion.

It is possible also that in a few cases the oblique ligament may be torn; but I could only produce this after very great traction; the interosseous membrane running downwards from radius to ulna will obviously be relaxed. There seems no doubt that considerable pain is produced by these sprains. The child, when brought, is often said to have "cried ever since we lifted it up," and the analogy to the interlocking of a

semilunar cartilage in the knee might be suggested. But it probably does not hold, since the orbicular ligament is not so definitely interlocked, it is much softer, and, as already pointed out, the interval between the two bones is usually very slight. If, however, the radius be somewhat dislocated forwards, the radial nerve may be stretched over it during extension, and this might possibly account for some of the pain.

The cases are of every-day occurrence at a large hospital, and those I have seen were hardly so fully pronated as the descriptions quoted would lead one to expect. The child seems naturally to pronate the hand after its forced extension and supination, but finding that something is wrong, keeps it at rest and as though helpless.

As regards treatment: The elbow should be flexed and then gently but fully pronated; if a click is audible one may feel certain that the orbicular ligament has descended, and that nothing further is necessary than rest with perhaps cold applications.

An interesting question is whether occasionally the displacement is left unreduced. It seems probable that this may happen, and may account for a slight abnormal projection of the radial head in adult life. I have seen one such case, and Mr. Holmes (*Surgical Diseases of Children*, 1868, p. 421) figures the elbow of a child "out of which the radius could easily be made to project, and as easily to recede into its cavity." Plainly it must first have slipped below the orbicular ligament. What produces the clicking or snapping sound heard in all these cases either on reduction or at the time of the accident? Perhaps it is more allied to the sound heard on separating the femur from the acetabulum than when two bones are struck together. It is sometimes so loud that "fracture of the radial neck" and "separation of the upper epiphysis" are diagnosed from it—both are very unlikely. They both, however, point to the fact I wish to lay stress on, that in at any rate the great majority of cases the lesion is at the elbow. Further evidence is required of the real existence of the displacement described by MM. Tillaux and Goyrand—I have hitherto failed to produce it in the dead subject.

So far one has been dealing with what can be proved by ex-

periment, but there remains to be noticed a matter which can only rest on probability.

These sprains are very common in young children; disease of the elbow joint is also common in them (taking one year at the London Hospital, one-third of the cases admitted from this cause were children under nine), is there any definite relation between them? It has been mentioned that in severe cases of the elbow-sprain the thin membrane connecting the orbicular ligament with the neck of the radius is torn away from its attachment to that bone. This membrane, which for brevity's sake, one may term the sub-orbicular, is so slight as hardly to receive notice in some anatomical works, but it serves the important purpose of shutting in the synovial cavity at the lower and outer part, and its rupture, of course, means a tear in a structure directly continuous with the periosteum.

Cases are sometimes met with in which acute periostitis of the radius follows a more or less severe injury to the elbow in children, and it seems unlikely that contusion of the bone should have caused it. I may briefly quote two—in one of which there is evidence that the neck of the bone was the part chiefly affected.

Ada T., aet. 6, after an injury to the left arm received during a fall out of a window (there was no bruising of the part), was admitted a few days later with swelling of the hand and forearm, the arm also being swollen up to the shoulder. There was obscure fluctuation in the forearm, and several incisions having been made in this and the arm, pus, containing many micro-organisms, was let out by Mr. Treves, to whom I am indebted for permission to publish the case.

Slight relief followed, but she was delirious; pneumonia came on with thrombosis of the small peripheral veins, and she died on the seventh day after admission. On post-mortem examination purulent pleurisy, sub-pericardial abscesses, and a multitude of small pyæmic abscesses in liver, kidneys, spleen and mesentery were found. There was pus in the left elbow-joint, in which the upper epiphysis of the radius lay loose, the capitellar surface was roughened, the periosteum peeled off radius, (especially at upper end); the muscles over it were matted together; there was no disease of ulna or humerus. On

section, the neck of the radius was seen to be intensely inflamed; the contrast between it and the rest of the bone being to some extent shown in Fig. 2.

The second case so closely resembles the first that a brief summary will suffice. A young boy, a few days after a fall (apparently onto one hand), became very ill, and died within a week of acute pyæmia. After death it was found that the humerus and ulna were normal; that the upper half only of the radius was affected with acute periostitis; no section was made of the bone. In both cases there was great swelling of the whole arm and forearm, and it might be well to suspect the radial neck as the part primarily diseased in similar ones, and so avoid making incisions over bones not affected. Of course it may be that a wrench of the biceps tendon sets up inflammation about the radial neck, but there was nothing to point to this in the case of Ada T.; its firm attachment must render it far less liable to be torn from the bone than the "sub-orbicular membrane."

I have seen one case where there was reason to think that the orbicular ligament had slipped downwards instead of upwards; it occurred in a young boy who came to the hospital with one radius slightly displaced outwards at the upper end, (there was no suspicion of fracture), so that whilst part of its head touched the capitellum, one's finger could be placed on a small part of its cup-shaped depression. The elbow was kept somewhat flexed; simple traction failed to reduce the deformity, but the test of full pronation was not tried. He left in order to get permission to take an anæsthetic and did not return. The external lateral ligament appeared to be stretched.

In concluding this account of the peculiar displacement of the orbicular ligament, I do not suppose for a moment that such a simple explanation of these common but perplexing cases of elbow-sprain in young children has not occurred to many observers. But it was owing to the uncertain statements found in the chief surgical works, and to my own doubt in dealing with these cases, that I thought it worth while to see if experiments on the dead subject would throw light on them, and to record the results in this paper.